From: Bob Merritt [mailto:bob.merritt7160@gmail.com]
Sent: Monday, March 17, 2014 6:59 PM
To: Hartman, Larry (COMM)
Cc: Willis Mattison
Subject: Sandpiper Pipleline

Mr. Hartman:

Were you able to obtain a complete copy of my Park Rapids testimony and all of the supporting documents? I was a bit confused during the presentation. I am used to a different format and assumed the persons behind the table were PUC Commissioners. That is why I provided my copies to them. It would be helpful in the future to explain when no PUC Commissioners are in attendance. Little did know that I was speaking to the pipeline officials. No wonder they appeared uninterested in my testimony and did not look at the figures to which I referred.

If you did not receive a complete copy of my information including yellow highlighted sections of the reports I referenced, please advise me. I would also like to know if you do have a complete copy.

I have updated my map to identify most of the irrigated parcels and highlighted locations of Park Rapids and Lamb Weston wells. I also increased its resolution; it is attached. All of Park Rapids and Lamb Weston wells are down gradient of any spill within the watershed. Spills will mobilize rapidly because of the vast number of high capacity irrigation wells between Park Rapids and the proposed pipeline.

During your opening remarks you identified a number of items that are used to determine suitability of an alignment. If I recall correctly, two of them were natural resources and proximity to towns. The proposed Sandpiper Pipeline has the potential of significant impacts to both. A spill like Embridge's in Bemidji will have greater consequences. It could greatly impact or even destroy a premium trout stream (Straight River) and it could reach the public water supplies of Park Rapids. Additionally, the high capacity irrigation could greatly exacerbate the situation, mobilizing the spill flow speed and area of influence. The attached map also identifies a major number of other wells near or down gradient of the proposed alignment. These are mostly in the surficial aquifer and are individual or small corporate supplies. A spill in these soils could have dire consequences to those individuals.

Alternative routes should be identified that do not contain such highly sensitive geologic conditions. Soils should be primarily till based which contain a substantial amount of clay; clay soils will slow and absorb a spill before disastrous affects will occur. The Pineland Sands Aquifer system clearly does not meet these criteria.

Please include this email and attached map to the Sandpiper docket information. If I have to take other actions to ensure that can transpire, please advise me.

Bob Merritt, P. G.
My address is 1241 Minnesota Avenue My
phone number is 218 850 7160

Sandpiper Pipeline Hearing
Park Rapids, MN
March 12, 2014

Testimony by Bob Merritt
B.S. and B.A. Geology
M.S. Hydrology
Minnesota Licensed Professional Geologist
MN DNR Area Hydrologist 32+ years`
Work Area Included Pineland Sands/Straight River Basin Outwash Aquifer in Becker and Hubbard Counties

First, I want to identify a problem I encountered while trying to review this project. I requested a GIS (Geographic Information Systems) layer of the pipeline alignment from the PUC. The PUC informed me that this information was Embridge work product which is exempt from the Freedom of Information Act. I assume the exemption was intended to protect public facilities from attack. Yet all existing pipelines are identified in paper and digital form on USGS topographic maps and Minnesota county maps. Additionally, with the GPS units available today, it is quite easy to map public utilities such as pipelines and processing plants. To withhold crucial information for my review hampered my analysis. I am still unsure of the exact proposed alignment and had to approximate it in one of my maps.

To me, it is ludicrous for a foreign company to invoke protection via exemption of the Freedom of Information Act under these circumstances; they are withholding crucial information for review with no real reason other than to hamper public review.

There have been 3 Major Studies of the glacial outwash plain comprising the Straight River basin and surrounding area:

- Helgsen, J.O., 1977. Ground water Appraisal of the Pineland Sands Area, Central Minnesota, USGS Water Resources Investigations Report.

- Stark, J.R., Armstrong, D.S, and Zwilling, D.R.. 1994, Stream – Aquifer Interactions in the Straight River Area, Becker and Hubbard Counties, Minnesota, USGS Water Resources Investigations Report 94-4009.

- Kruse, G and Frischman, J, 2002, Surface Water And Ground Water Interaction And Thermal Changes In The Straight River In North Central Minnesota, Minnesota Department of Natural Resources.

I was the main DNR person who identified the initial concerns leading to the Stark study, and I participated in both Stark's and the MN DNR investigations.

Helgsen and Stark described the geology of the area. Basically it is the intersection of at least 3 glacial lobes that ended in the area (Stark Figure 3). Glacial outwash is the result of glacial materials running off during glacial melting and retreat, forming sand and gravel fans interspaced with lake clay materials formed when lakes existed within

the area. The outcome is a series of 3 primary aquifers (Stark Figure 2). Stark's figure is generalized and does not entirely represent the aquifer configurations. The top aquifer is surficial and open to the atmosphere. The two lower aquifers are separated by clayey layers, but the layers thin and aquifers interfinger causing interchange between them. There is substantial evidence that the aquifers are hydraulically connected and water moves both upward and downward.

Because of their high degree of permeability, allowing rapid infiltration and movement, glacial outwash aquifers are some of the geologic environments most susceptible to contamination.

Helgesen estimated the aquifer groundwater hydraulic conductivities, a measure of ground water movement, between 320 and 630 ft/day. This is a rapid degree of ground water movement. Stark postulated that this area's groundwater movement is even greater than other similar aquifers within the state.

The area is covered with high capacity irrigation wells, which cause cones of depression, altering flow paths and moving substantial water towards the systems. (GIS 2010 Aerial Map).

Helgsen and Stark published potentiometric maps of the surficial aquifer (Helgsen Figure 7 and Stark Figure 15). I supplemented Helgsen's map and interpreted Stark's map to identify flow paths (red arrows). Water rapidly flows from the aquifer to the Straight River. The river gains at least ½ its flow from the aquifer. The hills to the north of the sand plain, the Itasca Lobe End Moraine, and the ground moraine provide about 25% of the aquifer's recharge. This is likely an even greater percentage closer to the Itasca End Moraine in the Park Rapids area. A pipeline leak in the Itasca End Moraine will end up flowing to Park Rapids. (Stark Figure 3)

Leaks within the aquifer will either end up in the Straight River or move towards the Park Rapids and the Potato Plant locations. High capacity pumping of these facilities along with irrigation wells near and down gradient of a spill or leakage has significant potential to incorporate petroleum products into the aquifer. Irrigation of the contaminated water will result in agriculture field contamination.

A leak along any portion of the pipeline from the Itasca Moraine north of the outwash sand plan through the entire plain has the potential to rapidly and permanently contaminate the aquifer. The surficial aquifer has the highest potential, but as noted earlier, all of the aquifers are interconnected. As a result, contamination of all the aquifers is a possibility. Once petroleum attaches to the sand and gravel grains, it is virtually impossible to remove the product. Each time rain, snowmelt or irrigation infiltrates through the aquifer, petroleum will be mobilized, causing ongoing contamination.

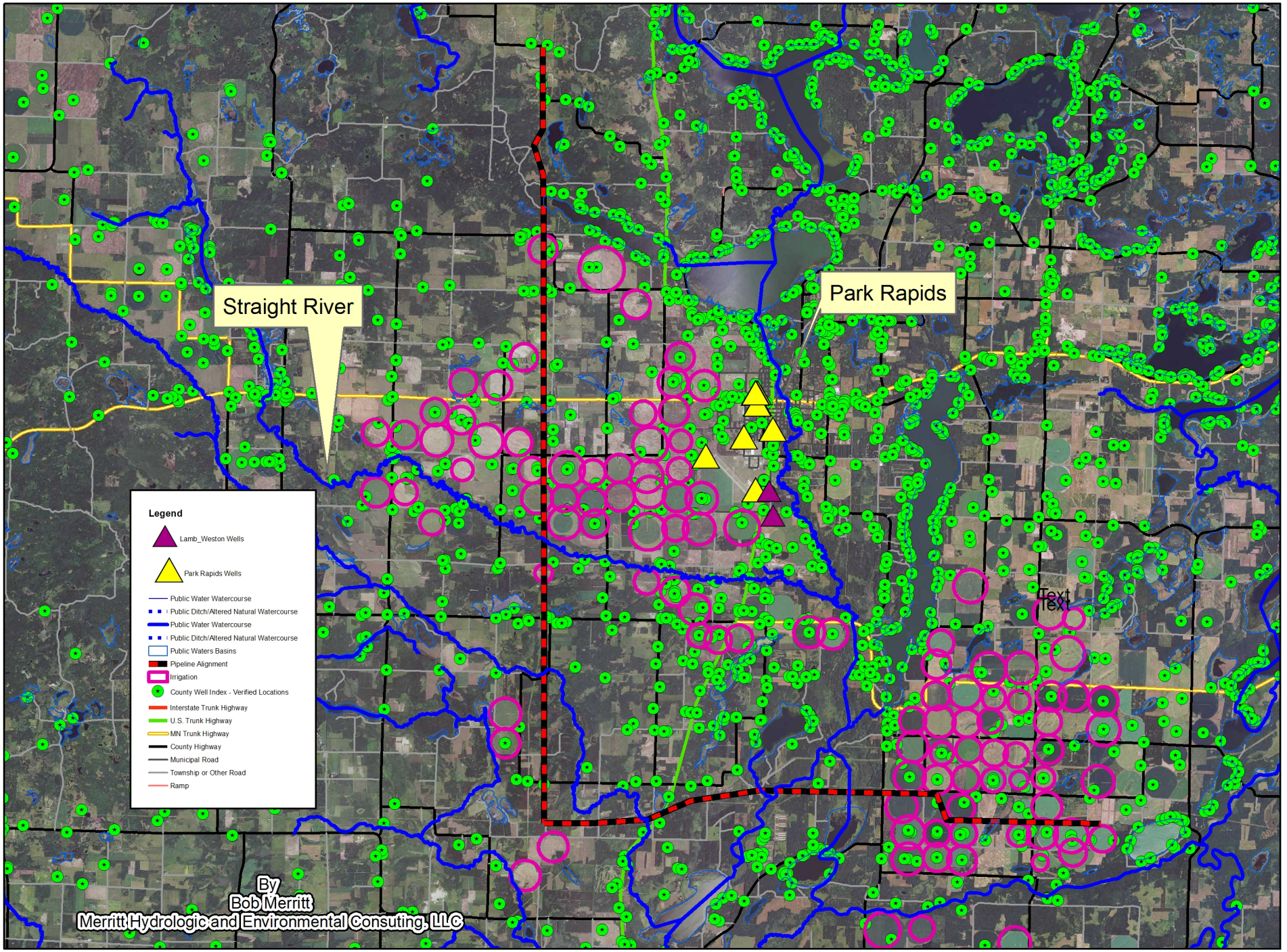
The surficial aquifer is used for irrigation and water supply. Surrounding wells already have high nitrates from the irrigation because of the high infiltration rates. Though

nitrate application through irrigation systems has been greatly improved by application only during the time plants require the nutrient, a Department of Agriculture study showed that approximately 60% of the nitrate is lost because of rapid infiltration. Once the nitrate passes through the root zone, it ends up in the surficial aquifer.

Because of nitrate contamination, Park Rapids will have to replace water supply wells. Osage had to in the past. Perham has had similar problems; it has the same geologic conditions. Petroleum will be even more damaging, causing loss of water supplies to individuals and communities down gradient of the leak. Straight River, the most important trout stream in Northwestern Minnesota, could also be severely affected due to petroleum contamination.

I urge you to reconsider this alignment and restrict pipelines within this highly sensitive geologic area. At the very least, I urge delay of your decision to allow further analysis with accurate data freely supplied by Embridge.

Sandpiper Pipeline Park Rapids Area
2010 Aerial Photo



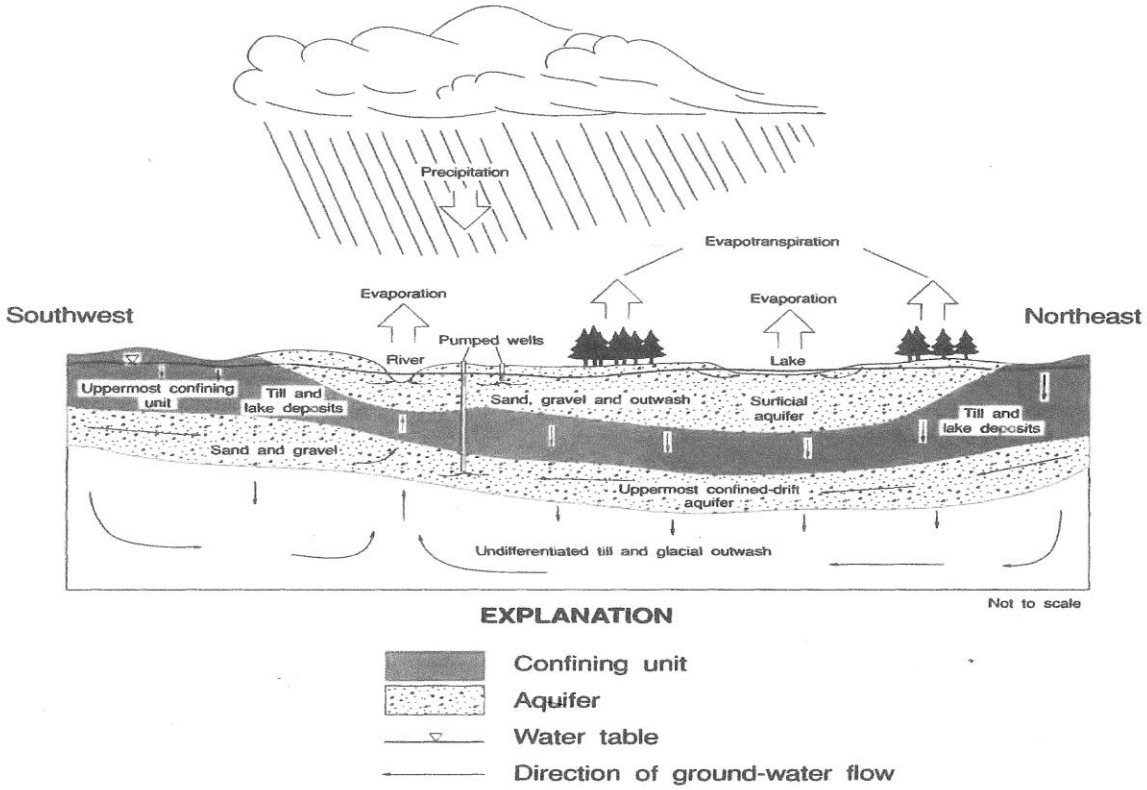


Figure 2.--Generalized hydrologic system of the Straight River investigation area.

From Stark 1994

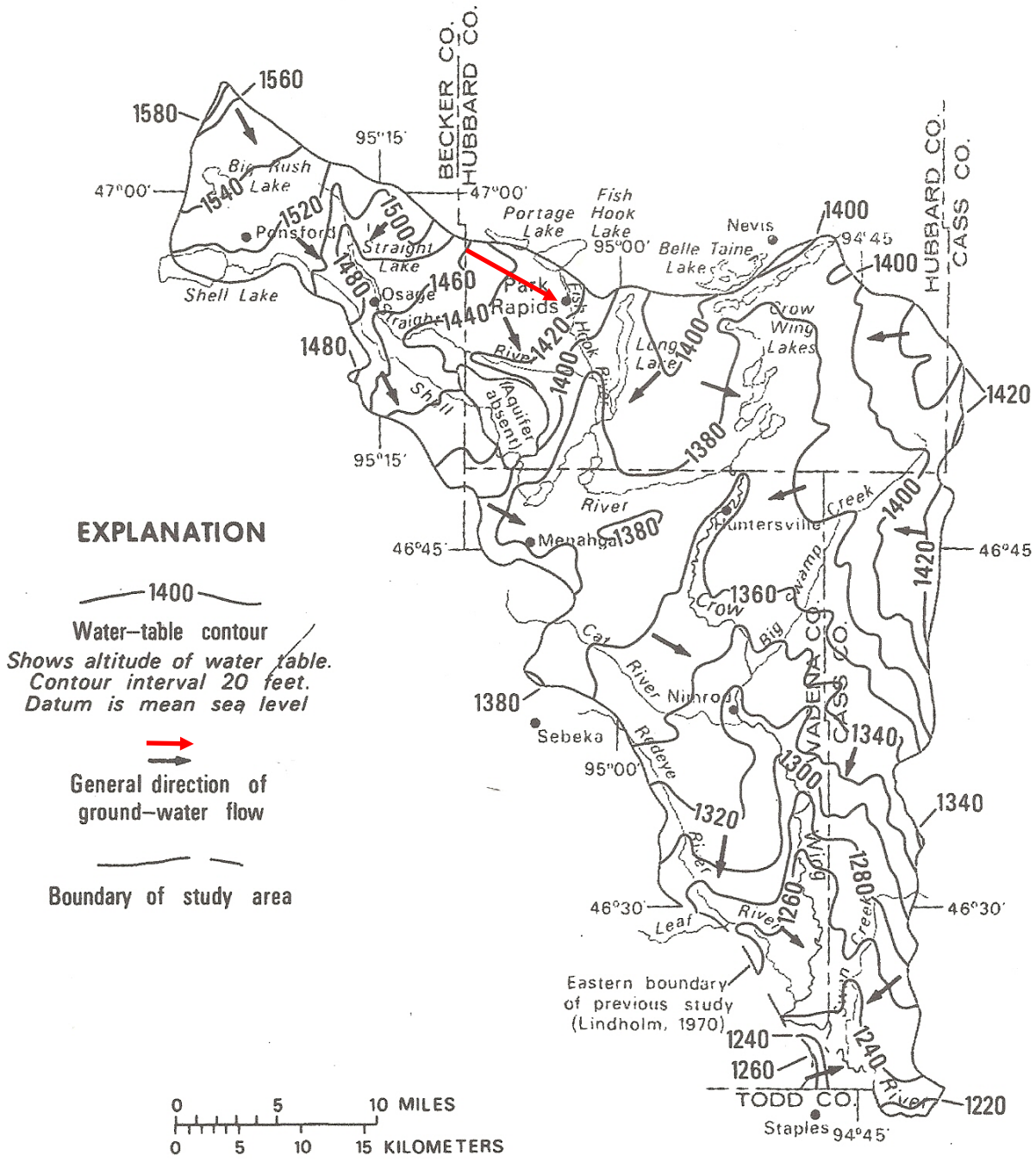


Figure 7.--Water-table configuration and general direction of ground-water movement.

From Helgsen 1977

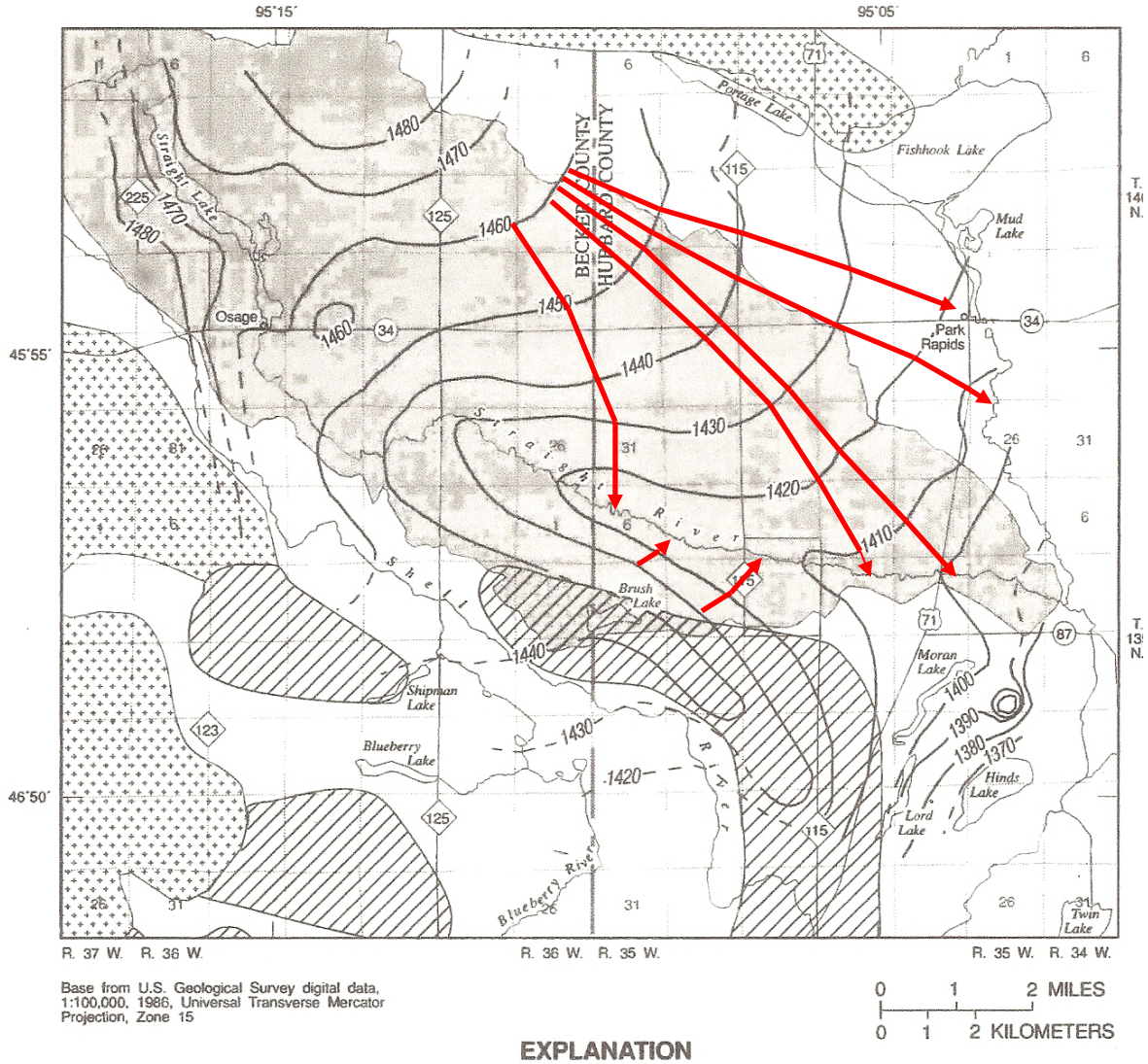


Figure 15.--Altitude of potentiometric surface (water table) of surficial aquifer during August 1988.

From Stark 1994

Sandpiper Pipeline Hearing
Park Rapids, MN
March 12, 2014

Testimony by Bob Merritt
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